

and later on by iron nails; and so he arrives at methods of building which persisted, with trifling variations, until wood gave place to iron in the last century. As regards propulsion a similar advance is traced from the single oar, to the rowing boat, and the galley with its banks of oars, coming at last to the use of masts and sails, as navigation took a wider and over-sea range. The special provisions made in vessels used for purposes of war are described, including that most ancient method of attack—the ram-bow. Altogether the book is an excellent piece of work.

W. H. W.

*A First German Course for Science Students.* By Prof. H. G. Fiedler and F. E. Sandbach. Pp. x+99. (London: A. Moring, Ltd., 1906.) Price 2s. 6d. net.

It is essential that students who intend to devote serious attention to science should be able to read scientific works in French and German, and, if possible, also in Italian. By the use of the present book a working knowledge of the German language can be obtained through lessons based upon work in elementary physics and chemistry. The book consists of a series of reading lessons describing simple experiments and principles such as are included in the rudimentary courses of schools. The words and phrases used in the various reading-passages are graded in such a way that the principal rules and grammatical forms are illustrated by the text. A short outline of grammar essential for the purpose in view follows the series of lessons, and there is a full vocabulary.

The book is printed in English characters, but the text and illustrations have a decidedly German appearance, as is appropriate in this case. Though the course covered by the lessons is similar in substance to that taken as introductory science in many schools, no doubt most teachers will prefer to follow English text-books for the actual work of the class-room and laboratory, and to use this book as an auxiliary aid or an incentive to the study of German. For pupils who are familiar with the experiments described, the book will be found very useful, and it will make them acquainted with the German equivalent of many technical terms not to be found in the ordinary reading books of the language. As an attempt to coordinate the teaching of modern languages and science, it will no doubt be appreciated, and for the finer feeling of literature pupils may still read extracts from the works of standard authors.

*Personal Hygiene Designed for Undergraduates.* By Dr. A. A. Woodhall. Pp. vii+221. (London: Chapman and Hall, Ltd., 1906; New York: John Wiley and Sons.) Price 4s. 6d. net.

PERSONAL hygiene is an important branch of hygiene which does not receive its full measure of treatment in any text-book, but this small work does not pretend to offer to its readers more than a clear and elementary statement upon the hygienic needs of the body. It is intended for undergraduate students, and it consists of the substance of lectures upon personal hygiene delivered by the author during the past few years. Exercise, food, clothing, habits, and similar matters of daily individual concern, are here dealt with in language as free from technical terms as possible. We are told in the preface that the constant aim of the writer has been to present actual conditions in the simplest language, and it must be said that he has achieved this object. We may add that the work is free from "Americanisms"—either of wording or spelling.

Only such elementary facts of anatomy and physiology as are necessary to the reasonable understanding of the subject are introduced, and some hints as to "first aid" are here and there given in the text, but this subject is otherwise omitted.

The chapters on alcohol, tobacco, and exercise are particularly good. They are discussed in tolerant language and with much sound common-sense. After reading the following opinion (p. 157) the reader will think twice before he refuses an offer of confectionery. "Where the taste has not been vitiated, in a degree by tobacco but chiefly by alcohol, sugar is as acceptable to the normal civilised man as it is to savages, and his disposition toward candy is no bad test of his drinking habits."

The following criticism of our national game of cricket will scarcely meet with approval in this country:—"Cricket, an exotic that has never taken wide root on our soil, lacks many of the qualities of a good game, chiefly because of the long waits before going to the bat and the limited number actively engaged." But though the author does not write in his usually well-informed manner upon this particular item, the following statement (p. 88) will serve to acquit him of the charge of bias towards *every thing* American:—"The misnamed nasal twang with which some Americans are justly charged is due partly to chronic catarrh, blocking the nasal passages, and partly to that curious and unconscious imitation by which in youth we acquire the tone most commonly heard. Unfortunately, as a people all our voices are too sharp and rasping. . . . We are so accustomed to strident voices that we fail to recognise their inherent infirmity."

*Life and Matter. A Criticism of Prof. Haeckel's "Riddle of the Universe."* By Sir Oliver Lodge. Pp. ix+200. (London: Williams and Norgate, 1905.) Price 2s. 6d. net.

It is difficult to pardon Prof. Haeckel for his dogmatism and his over-statements, and no less for his having furnished the peg on which have been hung many dull books and reviews. Forgiveness becomes easier when his work evokes a first-rate criticism like that in the volume before us. Sir Oliver Lodge contests chiefly (a) the right by which the name of Monism is arrogated to the Haeckelian philosophy; (b) Haeckel's statement of the "Law of Substance," the true account of which, according to the critic, is that "anything which actually exists must be in some way or other perpetual"; (c) Haeckel's account of the development of life, and particularly the theory which endows the atoms of matter with life, will, and consciousness.

The later chapters of the book state with great clearness Sir Oliver Lodge's own constructive views. He regards it as possible that life is a basal form of existence, as fundamental an entity as matter and energy. "It can neither generate nor directly exert force, yet it can cause matter to exert force on matter, and so can exercise guidance and control." His view occupies a middle position between the so-called monistic one and that, for example, of Prof. James Ward, who argues that the laws of physics are only approximate and untrustworthy.

The author, who understands well that effective illustration is half the difficulty, and that the "analogy of experience" is one of the soundest of philosophic principles, develops a fascinating comparison between life and magnetism. If we understand his views aright they imply that possibly mind can exist apart from terrestrial brains, and life apart from living creatures or plants as we know them—that is, that the phenomena of life and consciousness

which surround us are due to the interaction of something material and something spiritual, or (to express it otherwise) to the fact that something spiritual uses the material as its instrument or organ. This seems to imply a dualism, but he also holds it possible that "there may be some intimate and necessary connection between a generalised form of matter and some lofty variety of mind."

The arrangement of the various topics is not always the best possible. This is partly caused by the inclusion of reprints from well-known journals—a practice which is open to criticism. But apart from these slight defects the book deserves hearty commendation.

*The Fox.* By T. F. Dale. (Fur, Feather, and Fin Series.) Pp. xiii + 238; illustrated. (London: Longmans, Green and Co., 1906.) Price 5s.

"THE fox," writes the author in his opening paragraph, "is at home in Europe, Asia, including India, a great part of Africa, the whole of North America, and a distinct but allied species, *Canis virginianus*—known as the grey fox in the United States—is found in South America." If he had tried to compress as many errors as possible into a single sentence, he could scarcely have succeeded better. The fox is unknown in India proper, it inhabits only the northern fringe of Africa, and the grey fox (*Urocyon cinereo-argenteus*) is a native of North and not of South America. This is one of those numerous instances where authors of works on popular natural history will go out of their way to refer to subjects which they do not understand, and which do not concern them. Had Mr. Dale kept within his proper limits, we should have had nothing but commendation to bestow upon his work, in which the fox is discussed from the point of view of the sportsman and the farmer in a very thorough manner. The eight illustrations by Messrs. Thorburn and Giles are all that can be desired, although one of them follows somewhat closely on the lines of a well-known sketch by the late Mr. Wolf.

R. L.

*Oologia universalis palæarctica.* By Georg Kause. Part i. (Stuttgart: Fritz Lehmann, Verlag; London: Williams and Norgate.)

THIS is the first part of a beautiful egg book, printed entirely on separate sheets of cardboard, two sheets being devoted to each species—one of coloured figures of the eggs, the other of letterpress, backed with references to the specimens figured. The text is in German and English, and comprises a large number of synonyms and local names, and a short description of the range of the bird, its breeding habits, nest, eggs, &c. The four species treated of in the first part are the golden eagle, quail, song thrush, and raven, as many as sixteen (odd) eggs of the last-named bird (from different localities) being figured. In the case of the song thrush we have five "clutches," and in that of the golden eagle a clutch of two eggs and three single ones. The colour printing has been very successful, and admirers of eggs will welcome the excellent selection of varieties which has been figured, of each of which the "data" are given. We cannot extend the same praise to the English version of the letterpress, which is crude, too literal, and disfigured by unfamiliar words and expressions. However, it is possible to understand what is meant, although the remark on the quail that "the ♀ only breeds, the male is polygamons," reads strangely until we substitute broods for breeds and correct the misprint.

The work is to be complete in 150 parts, and Messrs. Williams and Norgate point out that on the publication of Part ii. the price per part will be raised from fifteen to eighteen pence.

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## LETTERS TO THE EDITOR.

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### Osmotic Pressure.

IN the concluding sentence of his most interesting letter on this subject in your issue of May 17 (p. 54) Mr. Whetham states that "The theory of ionic dissociation rests upon electrical evidence, and by such evidence it must be tried." It is unnecessary to dwell on the importance of the pronouncement.

Will Mr. Whetham kindly tell us *how we know* all the things which—in the final paragraph of his letter—he so confidently asserts that we know; in fact, what *precisely* the electrical evidence is upon which the theory of ionic dissociation *now rests*. He is a recognised master of lucid exposition and will be able, I am sure, as counsel of the whilom advocates of the doctrine of molecular suicide in solution, to state the case fully and fairly on their behalf. When we have this statement it will perhaps be possible to consider the validity of his modest contention and whether electricians alone have the right to pronounce judgment. A plaintiff is usually sure of his case before his cross-examination takes place.

This request is preferred in no adverse (i)r(onal) spirit, simply because I feel that it really is necessary that we should be informed where we are exactly. Our friends the ionic dissociationists are incorrigible squatters and seem to think that they have acquired the right of preemption over their adversaries' property; it is difficult to know, as they object to stock-taking, whether they have given anything in exchange for that they have lifted and what they have jettisoned of their original property; and until the electricians' title-deeds are shown and submitted to careful scrutiny, chemists can scarcely be expected to admit that they are ousted from possession.

As a chemist and a friend of the poor molecules, I feel that the aspersion of immorality should not be allowed to rest upon them for ever unless the evidence be really condemnatory beyond question. In any case, it is important that we should discover the true nature of the crime committed in solution; to cloak the inquiry by restricting it to thermodynamic reasoning—a favourite manœuvre of the mathematically minded—is akin to using court influence in abrogation of full and complete investigation; such a course may satisfy the physicist but is repulsive to the chemist, who, although able, perhaps, to imagine the existence of a frictionless piston, yet desires, in the first place, to get nearer to a knowledge of what happens to the real tangible piston of practice. HENRY E. ARMSTRONG.

MR. WHETHAM'S letter in NATURE of May 17 (p. 54) raises clearly the whole question of the applicability of thermodynamic reasoning to osmotic phenomena. As my views as to the value of thermodynamic reasoning appear to be somewhat heterodox, may I indicate some criticisms of his remarks?

All thermodynamic proofs assume the truth of the "second law." Now the machinations of Maxwell's demon have shown clearly that the meaning of this law, when interpreted in terms of the molecular theory, is merely that, in the processes considered, no differential treatment is applied to the molecules in virtue of their different velocities. The law may or may not be true in any particular case. It cannot be said that there is any *a priori* support for it, or that a proof of its validity for one small branch of phenomena would justify its application to a totally different branch.

In all treatises with which I am acquainted, when the law has been stated, the only reasons alleged for believing it to be true are those derived from our inability to construct a heat engine which will work without equalising temperature. A few pages, before or after, will be found the statement that we cannot construct a reversible heat engine; but it is not pointed out that the irreversibility of all actual engines would mask the effect of a violation of the second law, unless that violation were very complete and the separ-